

Work Order ID 139414

Friday, November 27, 2015 3:19:58 PM

139414

Page 1

Item ID: D6005-128

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Material

Start Date: 11/27/2015 Start Qty: 28.00

28

Cust Item ID:

Required Date: 8/30/2016 Req'd Qty: 28.00

28

Customer:

Reference:

Approvals:

Process Plan: MLJ

Date: 11-30

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D6005	B								

100

0.00

100

PURCHASING

Purchasing

Memo

0.00

Issue P/O:

30644

CZ

DEC 03 2015

28

a) Extrude as per Dwg D6005 length = 128" (Ref. D6005-128)

b) Material: 7075-T6/T6511 (WW-T-700/7 or QQ-A-225/9 or QQ-A-200/11))
Seamless aluminum tube

c) Minimum ultimate tensile strength = 77ksi

d) Minimum tensile yield strength = 66ksi

Ensure material certification is attached

***EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE
SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH
AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS,
OR DENTS.***

MUST BE WELL PACKAGE, IF NOT IT WILL BE REFUSE

Page 2

NS1*

NS2*

NR1*

NR2*

Insp.
er Stamp

04-28

DAS
16
9-89

2016/04/27

PTD →

16/05/02

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: <u>139414</u>		DISPOSITION		AGAINST DEPARTMENT/PROCESS																			
Part No. <u>D6005-128</u>		Rework ☐		Skid-tube ☐		Cross tube ☐		Water Jet ☐		Engineering ☐													
NCR No.		Scrap ☐		Machining ☐		Small Fab ☐		Prod. Eng. Coord. ☐		Quality ☐													
		Use-as-is ☐		Thermoforming ☐		Finishing ☐		Rec/Store/Packaging ☐		Other ☐													
		Suspected Unapproved ☐		Large Fab ☐		Composite ☐		Supplier ☐															
Date: <u>2016/04/28</u>		Step #: <u>120</u>		QTY Effective :				MRB (QSI042) Approval															
Description Work Order Deviation				Disposition				DAS 16 9-89 <u>16/04/28</u>															
change step # 120 to QC18 inspection								Completed By															
								Lead hand / Supervisor Approval Verification															
								QC / QA Coordinator Approval															
				DAS 16 9-89 <u>16/04/28</u>																			
Root Cause												FAULT CATEGORY											
Environment ☐												Pressure/Forced ☐											
Design ☐												Temperature/Cure ☐											
Doc/Data ☐												Set-up ☐											
Equip/Tooling ☐												BOM/Route ☐											
Handling/Pre ☐												Broken/Damage/Defect ☐											
Material ☐												Inspection Incomplete/Unqualified ☐											
Internal Transport ☐												Contamination ☐											
Tribal Knowledge ☐												Countersink ☐											
LOA ☐												Cut Too Short ☐											
Substation ☐												Instructions Incomplete/Unclear ☐											
Past Expiry Date ☐												Drill Holes ☐											
Misidentified ☐												Power Loss/Surge ☐											
No Re-verification ☐												Folio/Program ☐											
Operator ☐												Grain ☐											
Offset/Setup ☐												Weld ☐											
Supplier ☐												Wrong Stock Pulled ☐											
Training ☐												Out of Sequence ☐											
Use for Testing ☐												Off-set ☐											
Poor Information ☐												Mislabeled ☐											
Rushing ☐												Fit/Function ☐											
Product Improvement ☐												Misaligned/off center ☐											
Process Improvement ☐												Positioned Wrong ☐											
Manufacturing Process ☐												Outside Dimensions ☐											
Past Due ☐												Over/Under tolerance ☐											
OTHER : _____												Part Incorrect ☐											
												Part Lost/Missing ☐											
												Part Moved ☐											
												Drawing ☐											
												Finish ☐											
												Misread ☐											
												Turning Sequence ☐											

Engineering ☐
Quality ☐
Other ☐

MRB (QSI042) Approval

Completed By

Lead hand / Supervisor
Approval Verification

QC / QA Coordinator
Approval

Positioned Wrong ☐
Outside Dimensions ☐
Over/Under tolerance ☐
Part Incorrect ☐
Part Lost/Missing ☐
Part Moved ☐
Drawing ☐
Finish ☐
Misread ☐
Turning Sequence ☐

Work Order ID 139414

Friday, November 27, 2015 3:19:59 PM

139414

Page 3

Item ID: D6005-128

Accept

N900040100

Setup Start

NS1

Revision ID:

Item Name: Crosstube Material

Stop

NS2

Start Date: 11/27/2015 Start Qty: 28.00

28

Cust Item ID:

Required Date: 8/30/2016 Req'd Qty: 28.00

28

Customer:

Reference:

Approvals:

Process Plan: _____

Date: _____

Tooling: _____

Date: _____

Run

Start

NR1

QC: _____

Date: _____

SPC (Y/N): _____

Date: _____

Stop

NR2Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

160

QC21- Final Inspection - Work Order Release

0.00

160

QC

Memo

0.05

Quality Control

MLJ

MAY 03 2016

Lm 16/05/02



consignee : DART AEROSPACE LTD.
HAWKESBURY

client: 40980

confirmation # : 59326/100

purchase order : P030644

AWU article : 36744 /2,750 x ,375 x 128,000 - ,000 I

client article : D6005-128 2.750 X 0.375 X 128

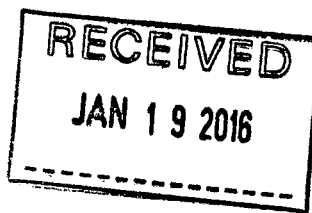
alloy : EN AW-7075 Int. Alloy No. : 7075

quantity : 30 gross : 604,500 Kg
length : 3.251,00 MM net : 494,000 Kg
package id : 127954 piece : 1 case no. : 1
pcs. / length / cast no. / heat no
30x3251,00/4480 - 804615

information :
supplier : Aluminiumwerk Unna AG
contact : fon +49(0)2303-206- 0
date : 9.03.2016

Uelzener Weg 36 - D-59425
fax +49(0)2303-206-116

SP/6-01-28



Aluminiumwerk Unna AG · Uelzener Weg 36 · D-59425 Unna

DART AEROSPACE LTD.
1270 Aberdeen Street
HAWKESBURY ON K6A 1K7

Kanada

Aluminiumwerk Unna AG

Uelzener Weg 36 · D-59425 Unna

Postfach 11 46 · D-59401

fon +49 (0) 23 03-206 -0

fax +49 (0) 23 03-206- 116

petra.eisenblaetter@alunnatubes.com

www.alunnatubes.com

page: 1

date: 1.06.2016

customer 40980

order confirmation

59326

your PO dated: 12.03.2015
your PO No.: PO30644
your ref.: Linda Lacelle

contact: Petra Eisenblätter
Tel.: + (303) 755 5672
Fax: + (303) 755 5936

representative: David Taylor

We supply acc. to our delivery terms and conditions:

item	quantity	unit	price USD	unit value USD	delivery
100	28,000	PC	462,00	PC 12.936,00	May 02, 2016

AWU article: 36744 / *Recu 30X Spillo 4-28* / Tariff no. 76082081

Customer article: D6005-128 2.750 X 0.375 X 128 / cust. drwg.

product: Tubes / seamless extruded / EN AW-7075 / round

condition: T 6511 / AMS-QQ-A-200/11(A)

outer diameter:	2,750 INCH Tol.	+0,012	-0,012
tol. for mean OD		+0,006	-0,006
inner diameter:	2,000 INCH		
wall thickness:	0,375 INCH Tol.	+0,038	-0,038
fixed length	128,000 INCH Tol.	+0,125	

test report acc. to EN 10204/3.1 / RM 531 / Rp0,2: 455

straightness 0,01 INCH / 1 FEET / RMS max.: outer 25

tol. on quantity +10 % -10 % / scurfed

2.750" OD 0.375" Wall, 128" lengths

Part Number D6005-128 crosstube

Surface Finish max. RMS 25

Tolerances per ASTM B210 / your drawing D6005

ACCT. #	_____
ACCT. NAME	_____
POSTING #	_____
APPROVAL	_____

Nationalbank AG, Dortmund

IBAN : DE46 3602 0030 0008 5203 72
BIC : NBAG DE 3 E

Sitz der Gesellschaft: Unna
Amtsgericht Hamm. HRB 3045

Vorstand: Thomas Wiese

Vorsitzende des Aufsichtsrats: Irene Wiese

Abnahmeprüfzeugnis 3.1 - DIN EN 10204:2005

Inspection Certificate 3.1 - DIN EN 10204:2005 / Certificat de Reception 3.1- DIN EN 10204:2005

Kunde: Dart Aerospace Ltd.
Client:

1270 Aberdeen Street
K6A1K7 Hawkesbury, ON Canada

Zeugnisnummer: 280/16

Cert No.: / No. du certificat:

Bestellnummer: PO30644

Order No. / No. de commande

Auftrag: 59326/100

Our Reference/Notre Reference:

Produkt: Rohre nahtlos gepresst

Product / Produit: Tubes seamless-extruded

Spezifikation: AMS - QQ - A - 200/11A; -

Specification:

Werkstoff: 7075

Alloy/Alliage:

Zustand: T 6511

Temper/État

Abmessung: 2,750 INCH x 2,000 INCH x 0,375 INCH x 128,000 INCH

Size / Dimension

Kennzeichnung

Marking/Marquage:

ALUnna - Cert. No. 280/16 - 7075 - T 6511 - Cast No. 4480 - AMS - QQ-A- 200/11 A - 2.750" OD X 0.375" Wall - Heat Lot No. 804615 - ALUnna Order Conf. No. 59326/100-1-P.O. 30644

Lieferung

Delivered Material / Matériel délivré:

pcs.

lbs

30

1089

Country of Manufacture: Germany

Products are in accordance with applicable RoHS

1. Chemische Analyse

Chemical Analysis / analyse chimique

	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Pb	Zr	Bi	Sn	Ni	Na
Charge/ min.			1,2		2,1	0,18	5,1							
Cast No. max.	0,40	0,50	2,0	0,30	2,9	0,28	6,1	0,20						
4480/15	0,187	0,187	1,521	0,097	2,573	0,200	5,583	0,037	0,003	0,0174	0,0001	0,0015	0,0050	0,0004

Hydrogen content: 0,12

ccm/100 g Al Elements without indication < 0,01 %

country of melt manufacturer: Germany

2. Mechanische Eigenschaften

Mechanical Properties / Valeurs Mécaniques

Anforderungen Requirements	tensile (Rm) ksi	yield (Rp0,2) ksi	elongation 2" %	elongation A %	Hardness HB	Cast/Heat/ pcs.
	81,0	73,0	7,0			
1	84,680	76,125	10,0			4480/804615/30 pcs.
2	81,635	73,225	10,0			

RMS: outside 25 - max. 10,3 µ"

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9-89

2016/04/29

**Ergebnis der
Prüfungen:**

Es wird bestätigt, daß die Lieferung geprüft wurde und den Vereinbarungen bei der Bestellannahme entspricht

Test results:

We confirm that the delivery has been tested and applies to the agreements made on receipt of the order

Resultats:

Nous confirmons que la livraison a été contrôlée et correspond avec les conventions faites à la réception de la commande

GschwindU



Certified acc. DIN EN ISO 9001:2008 and DIN EN 9100:2009
valid until 2016-11-10

Cert.- Reg. No.: 001959 QM08; 001959 ASH 09-1

ALUnna

Abnahmebeauftragter

10.03.2016

Aluminiumwerk Unna AG, Uelzener Weg 36, 59425 Unna, Germany

MATERIAL RECEIPT INSPECTION FORM

MATERIAL: D6005-128
 DATE: 2016/04/28

PO / BATCH NO.: P030644 / B139414

MATERIAL CERT REC'D: YES
 QUANTITY RECEIVED: 28 PCS
 QUANTITY INSPECTED: 12 PCS
 QUANTITY REJECTED: _____

THICKNESS ORDERED: SEE ATTACHED EXTRUSION
 THICKNESS RECEIVED: Report
 SHEET SIZE ORDERED: N/A
 SHEET SIZE RECEIVED: N/A

DESCRIPTION	NCR (Check Y/N)		COMMENTS
SURFACE DAMAGE	Y	☒	
CORRECT FINISH	☒	N	
CORROSION	Y	☒	
CORRECT GRAIN DIRECTION	☒	N	
CORRECT MATERIAL	☒	N	7075-T6
CORRECT THICKNESS	Y	N	SEE ATTACHED EXTRUSION Report.
PHOTO REQUIRED	Y	☒	
CORRECT MATERIAL	☒	N	AMS-QQ-A-200
CORRECT REF # TO LINK CERT	☒	N	P030644
CORRECT MATERIAL IDENTIFICATION	Y	N	N/A
CORRECT M# ON THE MATERIAL	Y	N	N/A
DOES THIS MATERIAL REQUIRE ENGINEERING SIGN OFF	Y	☒	
DOES THIS REQUIRE AN EXTRUSION REPORT	☒	N	

CUT SAMPLE PIECE OF MATERIAL AND PREFORM A HARDNESS CHECK. RECORD RESULTS BELOW					
TYPE OF MATERIAL SIZE OF TEST SAMPLE HARDNESS / DUROMETER READING	HRC	HRB	DUR A	DUR D	N/A

testers located in the Quality Office

QC 13 INSPECTION		ENGINEERING SIGNOFF (if required)	
INSPECTED BY: <u>5</u>	SIGNED OFF BY: _____		
DATE: <u>10/04/28</u>	DATE: _____		

Attach this inspection sheet with the corresponding material cert and remit to be scanned and received in

MATERIAL RECEIPT INSPECTION FORM

INSTRUCTIONS FOR INSPECTING BAR, TUBING, ROUND, & SHEET STOCK

- 1- VERIFY STOCK TO DART PURCHASE ORDER
- 2- MEASURE ALL DIMENSIONS FOR EACH PURCHASED STOCK
 - a. WIDTH, THICKNESS, DIAMETER, WALL THICKNESS & LENGTH
- 3- VERIFY CONDITION OF MATERIAL i.e. DAMAGED, CORRODED, etc.
- 4- VERIFY THAT SUPPLIER HAS A NUMBER (HEAT #) ON ITS RECEIVING REPORT TO LINK TO MATERIAL CERTS
- 5- VERIFY MATERIAL CERTS ARE CORRECT TO THE DART PO INSTRUCTIONS
- 6- REMOVE / CUT A PIECE OF MATERIAL FOR SAMPLE HARDNESS TESTING

INSTRUCTIONS FOR INSPECTING SKIDTUBE & STEP EXTRUSION

- 1- VERIFY TO DART SUPPLIED DRAWING
- 2- SAMPLE INSPECT MATERIAL IN BUNDLE TO ENSURE MATERIAL CAN BE RECEIVED INTO DART
- 3- USING PORTABLE HARDNESS TESTER VERIFY HARDNESS OF THE MATERIAL TO THE DRAWING
- 4- VERIFY THAT MATERIAL CERTS MATCH TO WHATS CALLED UP ON THE DART DRAWING

AFTER MATERIAL PASSES INSPECTION

- 5- HAVE DART EMPLOYEES START STOCKING MATERIAL BUT REQUEST MIN 20pcs FOR FULL INSPECTION
- 6- INSPECT ALL DIMS AS PER DRAWING REQUIREMENTS

INSTRUCTIONS FOR INSPECTING CROSS TUBE MATERIAL

- 1- VERIFY MATERIAL CERTS MATCH THE REQUIREMENTS ON THE DART DRAWINGS
- 2- INSPECT MIN. HALF THE BATCH OF EXTRUSION RECEIVED INTO DART
- 3- INSPECT MATERIAL AS PER THE EXTRUSION REPORT
 - a. WALL THICKNESS USING ULTRA-SONIC IN 4 LOCATIONS
 - b. OUTSIDE DIAMETER HIGHEST/LOWEST BOTH ENDS
 - c. INSIDE DIAMETER HIGHEST/LOWEST BOTH ENDS
 - d. STRAIGHTNESS @ CENTER OVER 12" SPAN
 - e. WALL THICKNESS USING TUBE MICROMETER HIGHEST/LOWEST BOTH ENDS
- 4- IDENTIFY EACH TUBE IN SEQUENCE OF INSPECTING (TUBE 1, TUBE2.....) AND W/O# AND PO#
- 5- RECORD ALL FINDINGS ON EXTRUSION REPORT

IF ANY QUESTIONS PLEASE SEE QC COORDINATOR BEFORE GOING FURTHER

EXTRUSION INSPECTION SHEET



TUBE #	TOTAL LENGTH	SIDE A		SIDE B		Measurement unit		Symbol		ULTRA SONIC MEASUREMENTS					
		DIA		DIA		INSIDE DIA	wall thickness measured w/vern	Strightness at 12" in middle	Rockwell Reading	LOCATION on tube	R1	R2	R3	R4	
		R1	R2	R1	R2										
DWG	128.00"	2.750"				2.000"	0.375"	0.010"	N/A	Middle	N/A				
1	128"	2.747"	2.748"	2.743"	2.75"	1.993"	0.377"	0.368"	0.006"	N/A	Middle	0.377"	0.376"	0.376"	0.376"
2	128"	2.742"	2.75"	2.743"	2.747"	1.997"	0.373"	0.363"	0.002"	N/A	Middle	0.368"	0.382"	0.376"	0.366"
3	128"	2.747"	2.751"	2.749"	2.744"	1.987"	0.376"	0.364"	0.004"	N/A	Middle	0.37"	0.375"	0.377"	0.374"
4	128"	2.747"	2.75"	2.748"	2.749"	1.994"	0.382"	0.368"	0.002"	N/A	Middle	0.377"	0.376"	0.373"	0.371"
5	128"	2.749"	2.753"	2.748"	2.75"	1.991"	0.382"	0.362"	0.004"	N/A	Middle	0.376"	0.377"	0.369"	0.37"
6	128"	2.747"	2.749"	2.748"	2.749"	1.996"	0.366"	0.372"	0.005"	N/A	Middle	0.369"	0.374"	0.377"	0.374"
7	128"	2.747"	2.75"	2.748"	2.749"	1.996"	0.368"	0.372"	0.01"	N/A	Middle	0.376"	0.376"	0.373"	0.376"
8	128"	2.749"	2.75"	2.749"	2.748"	1.998"	0.363"	0.379"	0.004"	N/A	Middle	0.371"	0.374"	0.376"	0.375"
9	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
10	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
11	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
12	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
13	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
14	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
15	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
16	"	"	"	"	"	"	"	"	"	N/A	Middle	"	"	"	"
PART # D6005-128		P/O# 30644				BATCH # 139414				Notes:					

DAS
16
9-89 2016/04/29

MEAN OUTSIDE DIAMETER PERMISSIBLE ± 0.006 side A

Tube #	Actual A	Actual B	Mean	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.747	2.748	2.748	0.00	0.006	-0.006	0.006	2.754	2.742
2	2.742	2.750	2.746	0.00	0.006	-0.006	0.006	2.752	2.740
3	2.747	2.751	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
4	2.747	2.750	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
5	2.749	2.753	2.751	0.00	0.006	-0.006	0.006	2.757	2.745
6	2.747	2.749	2.748	0.00	0.006	-0.006	0.006	2.754	2.742
7	2.747	2.750	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
8	2.749	2.750	2.750	0.00	0.006	-0.006	0.006	2.756	2.744

MEAN OUTSIDE DIAMETER PERMISSIBLE ± 0.006 Side B

Tube #	Actual A	Actual B	Mean	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.743	2.750	2.747	0.00	0.006	-0.006	0.006	2.753	2.741
2	2.743	2.747	2.745	0.00	0.006	-0.006	0.006	2.751	2.739
3	2.749	2.744	2.747	0.00	0.006	-0.006	0.006	2.753	2.741
4	2.748	2.749	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
5	2.748	2.750	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
6	2.748	2.749	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
7	2.748	2.749	2.749	0.00	0.006	-0.006	0.006	2.755	2.743
8	2.749	2.748	2.749	0.00	0.006	-0.006	0.006	2.755	2.743

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side A

Tube #	Actual A	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.747	0.000	0.012	-0.012	0.012	2.759	2.735
2	2.742	0.000	0.012	-0.012	0.012	2.754	2.730
3	2.747	0.000	0.012	-0.012	0.012	2.759	2.735
4	2.747	0.000	0.012	-0.012	0.012	2.759	2.735
5	2.749	0.000	0.012	-0.012	0.012	2.761	2.737
6	2.747	0.000	0.012	-0.012	0.012	2.759	2.735
7	2.747	0.000	0.012	-0.012	0.012	2.759	2.735
8	2.749	0.000	0.012	-0.012	0.012	2.761	2.737

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side b

Tube #	Actual A	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.743	0.000	0.012	-0.012	0.012	2.755	2.731
2	2.743	0.000	0.012	-0.012	0.012	2.755	2.731
3	2.749	0.000	0.012	-0.012	0.012	2.761	2.737
4	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
5	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
6	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
7	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
8	2.749	0.000	0.012	-0.012	0.012	2.761	2.737

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side A

Tube #	Actual B	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
2	2.750	0.000	0.012	-0.012	0.012	2.762	2.738
3	2.751	0.000	0.012	-0.012	0.012	2.763	2.739
4	2.750	0.000	0.012	-0.012	0.012	2.762	2.738
5	2.753	0.000	0.012	-0.012	0.012	2.765	2.741
6	2.749	0.000	0.012	-0.012	0.012	2.761	2.737
7	2.750	0.000	0.012	-0.012	0.012	2.762	2.738
8	2.750	0.000	0.012	-0.012	0.012	2.762	2.738

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side b

Tube #	Actual B	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.743	0.000	0.012	-0.012	0.012	2.755	2.731
2	2.743	0.000	0.012	-0.012	0.012	2.755	2.731
3	2.749	0.000	0.012	-0.012	0.012	2.761	2.737
4	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
5	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
6	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
7	2.748	0.000	0.012	-0.012	0.012	2.760	2.736
8	2.749	0.000	0.012	-0.012	0.012	2.761	2.737

end measuement with vern

Mean OUTSIDE DIA. Permissible +- 0.015									
Tube	Actual A	Actual B	Mean	Nominal	Tolerance	min	max	min	max
1	0.377	0.368	0.373	0.375	0.015	0.360	0.390	0.0125	-0.018
2	0.373	0.363	0.368	0.375	0.015	0.360	0.390	0.008	-0.022
3	0.376	0.364	0.370	0.375	0.015	0.360	0.390	0.01	-0.020
4	0.382	0.368	0.375	0.375	0.015	0.360	0.390	0.015	-0.015
5	0.382	0.362	0.372	0.375	0.015	0.360	0.390	0.012	-0.018
6	0.366	0.372	0.369	0.375	0.015	0.360	0.390	0.009	-0.021
7	0.368	0.372	0.370	0.375	0.015	0.360	0.390	0.01	-0.020
8	0.363	0.379	0.371	0.375	0.015	0.360	0.390	0.011	-0.019

OUTSIDE DIA. Permissible +- 0.038								
Tube	Actual A	Actual B	Nominal	Tolerance	min	max	min	max
1	0.377	0.368	0.375	0.038	0.337	0.413	0.040	-0.045
2	0.373	0.363	0.375	0.038	0.337	0.413	0.036	-0.050
3	0.376	0.364	0.375	0.038	0.337	0.413	0.039	-0.049
4	0.382	0.368	0.375	0.038	0.337	0.413	0.045	-0.045
5	0.382	0.362	0.375	0.038	0.337	0.413	0.045	-0.051
6	0.366	0.372	0.375	0.038	0.337	0.413	0.029	-0.041
7	0.368	0.372	0.375	0.038	0.337	0.413	0.031	-0.041
8	0.363	0.379	0.375	0.038	0.337	0.413	0.026	-0.034

center measurment with ultra sonic

Mean OUTSIDE DIA. Permissible +- 0.015									
Tube	highest	lowest	Mean	Nominal	Tolerance	min	max	min	max
1	0.377	0.376	0.377	0.375	0.015	0.360	0.390	0.0165	-0.014
2	0.382	0.366	0.374	0.375	0.015	0.360	0.390	0.014	-0.016
3	0.377	0.370	0.374	0.375	0.015	0.360	0.390	0.0135	-0.017
4	0.377	0.371	0.374	0.375	0.015	0.360	0.390	0.014	-0.016
5	0.377	0.369	0.373	0.375	0.015	0.360	0.390	0.013	-0.017
6	0.377	0.369	0.373	0.375	0.015	0.360	0.390	0.013	-0.017
7	0.376	0.373	0.375	0.375	0.015	0.360	0.390	0.0145	-0.016
8	0.376	0.371	0.374	0.375	0.015	0.360	0.390	0.0135	-0.017

OUTSIDE DIA. Permissible +- 0.038								
Tube	highest	lowest	Nominal	Tolerance	min	max	min	max
1	0.377	0.376	0.375	0.038	0.337	0.413	0.040	-0.037
2	0.382	0.366	0.375	0.038	0.337	0.413	0.045	-0.047
3	0.377	0.370	0.375	0.038	0.337	0.413	0.040	-0.043
4	0.377	0.371	0.375	0.038	0.337	0.413	0.040	-0.042
5	0.377	0.369	0.375	0.038	0.337	0.413	0.040	-0.044
6	0.377	0.369	0.375	0.038	0.337	0.413	0.040	-0.044
7	0.376	0.373	0.375	0.038	0.337	0.413	0.039	-0.040
8	0.376	0.371	0.375	0.038	0.337	0.413	0.039	-0.042

Tube #	REQUIRED LENGTH inches	ACTUAL LENGTH inches	VARIANCE
1	128.000	128.000	0.000
2	128.000	128.000	0.000
3	128.000	128.000	0.000
4	128.000	128.000	0.000
5	128.000	128.000	0.000
6	128.000	128.000	0.000
7	128.000	128.000	0.000
8	128.000	128.000	0.000

Tube Dimensions in Cuff Area.

Tube #	Reading 1	Reading 2	Reading 3	Reading 4
1	2.7350	2.7425	2.7325	2.7470
2	In process of being machined			
3	2.7435	2.7430	2.7285	2.7540
4	2.7350	2.7485	2.7405	2.7425
5	2.7380	2.7455	2.7470	2.7400
6	2.7420	2.7470	2.7400	2.7385
7	2.7450	2.7425	2.7545	2.7295
8	2.7380	2.7510	2.7370	2.7570
9	2.7400	2.7435	2.7440	2.7415
10	2.7435	2.7445	2.7425	2.7455
11	2.7360	2.7435	2.7425	2.7410
12	2.7510	2.7370	2.7350	2.7565
13	2.7380	2.7470	2.7470	2.7455
14	2.7440	2.7395	2.7360	2.7425
15	2.7435	2.7435	2.7370	2.7525
16	2.7470	2.7360	2.7380	2.7465

Note: To ensure the finished material in the Cuff area of the Tube is not blemished a preferred dimension of 2.7440 is require, this allows the material to be machined.